Abstract

Water distribution systems convey drinking water from treatment plant and make available to consumers' taps. It consists of essential components like pipes, valves, pumps, tanks and reservoirs etc. The main concern in the working of a water distribution system is to assure customer demands under a choice of quantity and quality throughout the complete life span for the probable loading situations. However, in some cases, the existing infrastructure may not be adequate to meet the customer's requirements. In such cases, system modeling plays an important role in proper management of water supply systems. In present scenario, modeling plays a significant task in appropriate execution of water distribution system.

From the angle of taking management decisions valve throttling control and pumps speed control are very important. These operational problems can be addressed by manual control or by automatic control. The problem is the use of manual controls that slow down the effectiveness of the system. It reduces the efficiency of operation of valve or pump. To improve the efficiency of such water distribution systems, an automatic control based technology has been developed that links the operation of the variable speed pump control or valve throttling control. By employing an automatic control, the pump can adjust its speed at all times to meet the actual flow requirements of each load served.

In case of real system design Simulink is the most widely used tool. Commercial software package Matlab/Simulink used for creation of WDS model. The goal was to produce a model that could numerically analyze the dynamic performance of a water distribution system. A Comparison of single platform methodology (Simulink based

control) and double platform methodology (Matlab and EPANET based control) has been done. Nonlinear Dynamic Inversion (DI) Control system model is developed for WDS model in Matlab/Simulink environment. Controller gain parameters are the very important value in control prospective. If the controller gain parameters are chosen incorrectly, the controlled process input can be unstable, i.e. its output diverges, with or without oscillation Tuning is the adjustment of control parameters (gains) to the optimum values for the desired control response. There are several methods for tuning controller like manual tuning (Trial and error procedure), Ziegler-Nichols method, Output Constraint Tuning (OCT) etc.

Establishment of a pump operational policy by which all the reservoirs can be fed simultaneously to meet their requirements without creating undue transients. Tune the gain of DI controllers by different tuning methods and evaluate the best tuning method on the basis of controller performance. Development of meaningful additional objective is search of lower bound pump speed on the basis of control time or settling time. To bring the pump speeds in feasible range, application of constraint in pumps speed is introduced. The magnitude of constraints can be found using Monte Carlo methods. Monte Carlo methods are frequently used in simulating physical and mathematical systems. This method may be the most commonly applied statistical method in engineering and science disciplines. Another benefit is providing increased confidence that a model is robust using Monte Carlo testing.

Model development for generalized control system for water distribution network provides the simplification needed for the simulation of large systems. Model development is based on the study of symmetric and non symmetric small, irregular networks, as well as large, regular and open bifurcating water distribution system. The problem considered in this section is that of flow dynamics in simple to complex, regular network which bifurcates in the form of a branching tree. In addition the control application of the flow network is investigated using valves as the manipulated variables to control branch flow rates. Communication between the network hydraulics coming from EPANET and control algorithm develop on Matlab (Programming Language) can be generalized with the help of development of general purpose control algorithm model.